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A theoretical framework for managing training materials toward open education in colleges in mountainous areas

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Abstract---This study develops a theoretical framework for managing training materials toward open education in colleges in mountainous areas. Using document analysis, synthesis, systematization, and theoretical generalization, the study integrates three complementary perspectives: the Systems Approach, the Planning, Organizing, Leading, and Controlling management cycle, and the Technology Acceptance Model. The proposed framework consists of four interrelated components: context and inputs, management process, technology acceptance, and outputs and feedback. The framework explains the relationships among institutional conditions, management activities, technological systems, and users in the development, use, adaptation, and sharing of training materials. Particular attention is given to the specific conditions of mountainous colleges, including socioeconomic constraints, geographical characteristics, technological infrastructure, cultural and ethnic diversity, and the digital competence of lecturers and learners. The framework provides a theoretical basis for analyzing management practices and developing appropriate measures to improve the accessibility, effective use, sharing, and sustainable development of training materials toward open education in colleges in mountainous areas.

Keywords---theoretical framework, training materials, training materials management, open education, mountainous colleges.

1. Introduction

The development of open education has changed the ways in which educational resources are created, accessed, used, adapted, and shared. Open educational resources have become an important component of this transformation by



reducing barriers to learning materials and providing opportunities for more flexible access to knowledge. Research has shown that the use of open educational resources can support learning outcomes and provide an alternative to conventional educational materials (Fischer et al., 2015; Hilton, 2016). Beyond access to resources, open education can also contribute to changes in teaching practices, knowledge creation, and institutional approaches to educational provision (Lane & McAndrew, 2010; Scanlon, 2014; Littlejohn & Hood, 2017).

However, the availability of open educational resources does not necessarily ensure their effective and sustainable use. The adoption of these resources depends on multiple factors related to users, technologies, institutional environments, and educational contexts. Murphy (2013) highlighted institutional conditions and challenges associated with the adoption of open educational practices in higher education. Jung and Lee (2020) further demonstrated the relevance of cultural contexts to the adoption of open educational resources. From the perspective of individual users, studies have indicated that perceptions, attitudes, and willingness to use or create open resources can influence their adoption (Tang, 2020; Menzli et al., 2022; Adedoyin & Altinay, 2023). These findings indicate that open educational resources should be considered within a broader system involving institutions, users, technologies, and management processes rather than as independent learning resources.

This perspective is particularly relevant to the management of training materials in vocational colleges. Training materials are closely connected with curricula, occupational competency requirements, teaching activities, practical training, lecturers, learners, technological infrastructure, and institutional resources. Managing training materials toward open education therefore involves more than developing or digitizing materials. It requires institutions to establish objectives, organize resources and responsibilities, guide implementation, monitor outcomes, and continuously improve the processes through which materials are developed, accessed, used, adapted, and shared. From this perspective, a theoretical framework for managing training materials needs to capture both the systemic relationships among relevant components and the cyclical nature of management activities.

At the same time, the increasing dependence of open learning resources on digital technologies introduces another important dimension: technology acceptance. Even when institutions establish digital repositories or learning platforms, their effectiveness ultimately depends on whether lecturers and learners are willing and able to use them. Research on the adoption of open educational resources has demonstrated the importance of user-related factors in explaining the intention to adopt and use such resources (Tang, 2020; Menzli et al., 2022; Adedoyin & Altinay, 2023). Consequently, a management framework focusing exclusively on organizational structures and managerial functions may not sufficiently explain how training materials are actually accepted and used by their intended users.

The need for an integrated perspective becomes more pronounced in colleges located in mountainous areas. These institutions may operate under constraints related to socioeconomic conditions, geographical dispersion, technological infrastructure, financial resources, cultural and ethnic diversity, and the digital

competence of lecturers and learners. Under such conditions, the effectiveness of training materials depends not only on their quality and availability but also on institutional capacity to manage them and users' ability and willingness to access and use them. A theoretical framework for this context therefore needs to incorporate organizational, managerial, technological, and contextual dimensions.

Although previous studies have provided important insights into the effectiveness of open educational resources (Fischer et al., 2015; Hilton, 2016), changes in educational practices associated with openness (Lane & McAndrew, 2010; Littlejohn & Hood, 2017; Scanlon, 2014), institutional adoption (Murphy, 2013), and factors influencing the adoption of open educational resources (Jung & Lee, 2020; Tang, 2020; Menzli et al., 2022; Adedoyin & Altinay, 2023), these strands of research address different aspects of openness and resource adoption. There remains a need to connect the systemic structure of training materials management, the functions through which management is implemented, and the technological acceptance of users within a coherent theoretical framework, particularly for vocational colleges operating in mountainous areas.

Accordingly, this study aims to develop a theoretical framework for managing training materials toward open education in colleges in mountainous areas. The framework integrates three complementary perspectives: the Systems Approach, which explains the interrelationships among the components of training materials management; the Planning, Organizing, Leading, and Controlling management cycle, which structures the managerial process; and the Technology Acceptance Model, which addresses users' perceived usefulness and perceived ease of use of technology-based training materials and systems. By integrating these perspectives with the specific conditions of mountainous colleges, the study seeks to provide a theoretical basis for analyzing management practices, identifying influencing factors, and guiding the development of appropriate management measures for the effective and sustainable use of training materials toward open education.

2. Research Methods

This study employed theoretical research methods, including document analysis, synthesis, systematization, and theoretical generalization. Relevant studies on open education, open educational resources, educational management, and technology adoption were reviewed to identify theoretical perspectives related to the management of training materials. The selected perspectives were then analyzed and integrated, with particular attention to the Systems Approach, the Planning, Organizing, Leading, and Controlling management cycle, and the Technology Acceptance Model. On this basis, a theoretical framework was developed for managing training materials toward open education, taking into account the specific conditions of colleges in mountainous areas.

3. Results and Discussion

3.1. Theoretical Approaches to Managing Training Materials Toward Open Education

The development of a theoretical framework for managing training materials toward open education requires a combination of perspectives that can explain the structure of the management system, the management process, and users' acceptance of technology. In this study, three complementary approaches are used: the Systems Approach, the Planning, Organizing, Leading, and Controlling management cycle, and the Technology Acceptance Model.

Systems Approach. The Systems Approach considers the management of training materials as an interconnected system rather than a set of separate activities. The system includes management objectives, managers, lecturers and learners, training materials, financial and technological resources, management processes, outputs, and the external environment. Changes in one component may influence other components and the overall effectiveness of the system. This approach is particularly relevant to open education because training materials are closely connected with curricula, teaching practices, technology, institutional resources, and users.

Planning, Organizing, Leading, and Controlling management cycle. This approach provides the functional structure for managing training materials. Planning involves identifying needs, setting objectives, and determining resources and implementation plans. Organizing focuses on assigning responsibilities, allocating resources, and establishing procedures and technical systems. Leading involves guiding, coordinating, supporting, and motivating lecturers and other stakeholders in developing, using, and sharing training materials. Controlling involves monitoring, evaluating, and adjusting management activities and their results. These functions form a continuous cycle in which evaluation provides information for improving the next management cycle.

Technology Acceptance Model. Technology plays an important role in the development, storage, access, use, and sharing of training materials toward open education. Therefore, management effectiveness also depends on whether lecturers and learners accept and use technological systems. The Technology Acceptance Model emphasizes two important factors: perceived usefulness and perceived ease of use. In the context of open educational resources, previous studies have also shown that users' perceptions, attitudes, and intentions are associated with their adoption and use of open resources (Tang, 2020; Menzli et al., 2022; Adedoyin & Altinay, 2023).

These three approaches address different but closely related aspects of training materials management. The Systems Approach explains the relationships among components; the Planning, Organizing, Leading, and Controlling cycle explains how management activities are implemented; and the Technology Acceptance Model explains how users perceive and accept technology-based training materials and systems. Their integration therefore provides a suitable theoretical basis for developing a framework for managing training materials toward open education in colleges in mountainous areas.

3.2. An Integrated Theoretical Framework for Managing Training Materials Toward Open Education

Based on the three theoretical approaches discussed above, an integrated framework for managing training materials toward open education can be developed. The framework combines the systemic relationships among management components, the management cycle, and users' acceptance of technology. This integration is particularly relevant to colleges in mountainous areas, where the effectiveness of training materials depends on both institutional management and the conditions under which lecturers and learners access and use educational resources.

The proposed framework consists of four closely related components: context and inputs, management process, technology acceptance, and outputs and feedback. Context and inputs provide the conditions for the management process. They include policies and regulations, socioeconomic conditions, human resources, financial resources, technological infrastructure, and the specific characteristics of colleges and learners. In mountainous areas, geographical conditions, cultural and ethnic diversity, limited technological infrastructure, and differences in digital competence need to be considered when planning and managing training materials.

Management process is the central component of the framework and consists of four functions: planning, organizing, leading, and controlling. Planning determines objectives, priorities, and resources for developing training materials. Organizing establishes responsibilities, procedures, resources, and technical systems. Leading focuses on guiding, coordinating, and supporting lecturers and other stakeholders in developing, using, adapting, and sharing training materials. Controlling involves monitoring, evaluating, and adjusting activities to ensure that training materials meet educational objectives and the requirements of open education.

Technology acceptance connects management activities with the actual use of digital training materials. The two main elements are perceived usefulness and perceived ease of use. Lecturers and learners are more likely to use digital and open training materials when they consider them useful for teaching and learning and sufficiently easy to access and use. This aspect is especially important in mountainous areas, where differences in technological infrastructure and digital competence may influence the adoption of open resources.

Outputs and feedback reflect the results of the management process. Expected outputs include improved accessibility, quality, adaptability, use, reuse, and sharing of training materials. These outcomes should contribute to improving vocational training and expanding learning opportunities. Information obtained from monitoring, evaluation, lecturers, and learners provides feedback for adjusting objectives, resources, management activities, and technological systems.

The relationships among the components can be represented as follows:

Context and Inputs → Management Process → Technology Acceptance → Outputs
→ Feedback and Improvement

The framework should be understood as a continuous and interactive process rather than a one-way sequence. Contextual conditions influence management activities and technology acceptance, while evaluation and feedback provide information for adjusting subsequent management cycles. In this way, the Systems Approach provides the overall structure, the Planning, Organizing, Leading, and Controlling cycle organizes management activities, and the Technology Acceptance Model explains the relationship between technological systems and their users.

3.3. Application of the Theoretical Framework to Colleges in Mountainous Areas

The application of the proposed theoretical framework to colleges in mountainous areas requires consideration of their specific educational and socioeconomic conditions. Compared with institutions in more advantaged areas, mountainous colleges may face greater limitations in financial resources, technological infrastructure, Internet connectivity, and access to digital devices. Geographical dispersion can also make access to conventional learning resources and educational services more difficult. These conditions directly influence the development, distribution, and use of training materials.

Cultural and ethnic diversity is another important consideration. Training materials should be relevant to learners' cultural backgrounds, local knowledge, occupational practices, and learning needs. The use of open resources therefore requires appropriate selection and adaptation rather than simply transferring existing materials from other educational contexts. This is particularly important in vocational education, where training content needs to be connected with local socioeconomic conditions and employment opportunities.

Digital competence also affects the application of the framework. Lecturers need appropriate skills to search for, evaluate, adapt, develop, and share digital training materials, while learners need sufficient digital competence to access and use these resources effectively. The usefulness of technological systems alone is therefore insufficient. Such systems also need to be simple, accessible, and appropriate to users' technological conditions and digital abilities.

These characteristics require the management process to be flexible and context-sensitive. Planning should consider local needs and available resources; organizing should promote the effective use and sharing of limited resources; leading should provide professional and technological support for lecturers and learners; and controlling and evaluation should generate information for continuous adjustment. The framework therefore connects systematic management with technology acceptance and the specific context of mountainous colleges, providing a theoretical basis for improving the accessibility, use, sharing, and sustainability of training materials toward open education.

4. Conclusion

Managing training materials toward open education requires a theoretical perspective that considers not only management functions but also the relationships among institutional conditions, technological systems, and users.

This study proposes an integrated theoretical framework combining the Systems Approach, the Planning, Organizing, Leading, and Controlling management cycle, and the Technology Acceptance Model.

The framework consists of four interrelated components: context and inputs, management process, technology acceptance, and outputs and feedback. The Systems Approach provides the overall structure of the framework, the management cycle explains how management activities are implemented, and the Technology Acceptance Model highlights the importance of perceived usefulness and perceived ease of use in the adoption of technology-based training materials.

For colleges in mountainous areas, the framework also takes into account socioeconomic conditions, geographical characteristics, technological infrastructure, cultural and ethnic diversity, and the digital competence of lecturers and learners. The proposed framework provides a theoretical basis for analyzing current management practices and developing appropriate measures to improve the accessibility, use, sharing, and sustainable development of training materials toward open education.

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